tion is deduced and its consequences investigated, especially in helping to find potential. Spherical Harmonics occupy the next thirty-two pages. The very convenient and appropriate name "Laplacian" is here assigned to the important "Laplace's coefficients": by analogy the name "Legendrian" might well be applied to Legendre's coefficients; short terms of this kind are useful, and commemorate the inventors. The usual developments are given; the applications to symmetric bodies are interesting, *e.g.* a potential function (*i.e.* one such that $\nabla^2 v = 0$), which is the potential of a symmetric body for all points on its axis, is *the* potential of the body.

Chapter XVIII. (103 pp.), on Small Strains and Stresses, is divided into three sections.

Sec. I. (32 pp.). Small Strains.—This treats of the *small* strains (changes of shape or size) of a body without reference to their causes. It is shown that straight lines, planes, and parallels remain such, whilst spheres become ellipsoids, &c., and there is always one line of no rotation at every point. It is also shown that every strain may be resolved into a pure strain and a rotation, and that the strain proper may be produced by three elongations, or by one elongation and a contraction all round an axis (this is called traction). Torsion is shown to be equivalent to shear, and shear to be equivalent to an extension and contraction, &c.

Sec. II. (22 pp.). Stress.—This treats of internal stress apart from concomitant strain. The usual composition and resolution are investigated, the work of an actual strain and the virtual work of virtual strain are found, and the latter is shown to be an exact differential.

Sec. III. (49 pp.). Stress and Strain.—The relations between the moduli of compression (k) and distortion (μ), the contraction-coefficient (η), and Young's modulus (E) are first traced for isotropic bodies, and the strain- and stress-potentials found for the same, and it is shown that every force-system produces definite strain. The work in pure compression and pure twisting is investigated, and it is shown that twisting couples applied at ends of a cylinder produce pure torsion only in a circular cylinder, so that in other cases the plane sections are deformed. The theory of the slightly bent plane beam is investigated as far as the theorem of three moments. In heterotropic bodies it is shown the conservation of energy reduces the number of independent elasticity-coefficients from thirty-six to twenty-one. St.-Venant's reduction to fifteen for cases where the mutual action of two particles is independent of other particles is discussed, and is shown to lead to the value $\eta = \frac{1}{4}$ for the lateral contraction-coefficient of an isotropic body. Maxwell's researches on the propagation of gravitation are reproduced, and are described as showing that gravitation could be produced by a certain stress over a closed surface propagated through an all-pervading medium (ether) transferring strain like a solid, but further research shows that this ether is not quasi-solid.

Chapter XIX. (45 pp.). Electrostatics.—After the usual elementary propositions it is shown that a "line of force" meeting an electrified conductor obliquely is refracted, and that the charge-distribution over an isolated body is determinate: this leads to interesting problems in soap-bubbles. It is shown from Green's equation that a hollow conductor screens its contents from outer electric disturbance; this has a practical application in protection of delicate instruments inside a metallic cage. Lastly, the theory of electric images is discussed, and examples given.

From the full analysis given it will be seen that the work is a most important one: it is, in fact, one of the best treatises of the day.

ALLAN CUNNINGHAM, Major, R.E.

THE CRUISE OF THE "BACCHANTE"

The Cruise of Her Majesty's Ship "Bacchante," 1879 82. Compiled from the Private Journals, Letters, and Note-books of Prince Albert Victor and Prince George of Wales, with Additions by John N. Dalton. Two Vols. (London: Macmillan and Co., 1886.)

TO us the chief interest of these two bulky volumes lies in the fact that they are the record of what we may call the technical education of our future King and his brother. It was a right and proper thing for the Prince of Wales to do to see that his sons should become personally acquainted with the leading sections of that great Empire with the conduct of which they will in the future have so much to do. Indeed, in these times, when our colonies are coming so conspicuously to the front, when their affairs are regarded as of Imperial importance, it might be a good thing to insist that our Colonial Secretaries should follow the princes' example, and that no one should be considered qualified for the post of Minister for the Colonies who had not studied their affairs on the spot. Technical education is considered essential nowadays to any one occupying a responsible position in even the humblest of callings; but we fear that statesmanship is still beyond the pale of science.

In the volumes before us Canon Dalton has the lion's share. The princes' contributions have been edited by him from their diaries, note-books, and letters; while he himself contributes long sections in which he brings together much useful information, and discussions on the affairs of the various colonies visited. Of course the writings attributed to the princes are no doubt much indebted to the superintendence of their tutor; at the same time the boyish hands can be traced throughout. The whole work is creditable both to the princes and to Canon Dalton. They certainly worked hard both at their books and at their duties as middies; for in all respects when on board ship they were treated precisely as their mates. They evidently took a genuine interest in their duties on board; took a pride in mastering all the details of navigation and the working of a war-ship like the *Bacchante;* were as eager to pass their examinations as if their future careers depended on the result. Much of their share of the work consists of details as to the day's cruise, their own work as officers, the exercises proper to such a ship, and the incidents of the gun-room. Mixed up with this are the results of their own observations in the countries visited, information gathered during their visits or from books, their experiences when sojourning in the colonies, in Japan and other countries, with occasional reflections suggested by all this. Canon Dalton's contributions are more solid and serious. He enters into

long details on the history and present condition of the colonies, referring at length to the various questions that are uppermost in each, giving as a rule fairly the views of the various parties, though by no means abstaining from showing his own leanings. Certainly the work contains a vast amount of useful statistical, historical, industrial, and commercial information on our colonies, and will be found of service to any one desirous of getting up the subject. Of course it is not to be expected that a work like this will contain much that is novel or of scientific value. In Japan the princes indeed saw a great deal which is not likely to come in the way of the ordinary visitor; while a large portion of the second volume is devoted to Egypt and the Holy Land, which they explored under the guidance of such specialists as Capt. Conder and Sir Charles Wilson, and therefore are able to record much of real and almost unique importance in the geography and antiquities of those interesting countries.

What can Canon Dalton mean by permitting the insertion of the following entry, without note or comment? The apparition is stated to have been seen on the passage from Melbourne to Sydney:—

"July 11.—At 4 a.m. the *Flying Dutchman* crossed our bows. A strange red light as of a phantom ship all aglow, in the midst of which light the masts, spars, and sails of a brig 200 yards distant stood out in strong relief as she came up on the port bow. The look-out man on the forecastle reported her close on the port bow, where also the officer of the watch from the bridge clearly saw her, as did also the quarterdeck midshipman, who was sent forward at once to the forecastle; but on arriving there no vestige nor any sign whatever of any material ship was to be seen either near or right away to the horizon, the night being clear and the sea calm. Thirteen persons altogether saw her, but whether it was *Van Diemen* or the *Flying Dutchman* or who else must remain unknown. [Here are a few German verses on the phantom ship.] The *Tourmaline* and *Cleopatra*, who were sailing on our starboard bow, flashed to ask whether we had seen the strange red light. At 10.44 a.m. the ordinary seaman who had this morning reported the *Flying Dutchman* fell from the foretopmast crosstrees on to the topgallant forecastle and was smashed to atoms. At 4.15 p.m. after quarters we hove to with the headyards aback, and he was buried in the sea. He was a smart royal yardman, and one of the most promising young hands in the ship, and every one feels quite sad at his loss."

Then follows a statement about the admiral having been "struck down," as if it had some connection with the apparition.

The cruise of the princes, which lasted from September 1879 to August 1882, was divided into two well-marked sections. The first, extending to May 1880, included visits to Gibraltar and the Mediterranean, Madeira, the Canaries, West Indies, and Bermudas. After a long visit to Vigo, the second part of the cruise was begun in August 1880. By Ferrol, Madeira, and the Cape Verde Islands the River Plate was made, where some time was spent ashore. After touching at the Falkland Islands, a run was made to the Cape, where several weeks were spent, during which the princes visited several parts of Cape Colony, and showed special interest in the Observatory under Dr. Gill. In the spring of 1881 a long, stormy, and dangerous run was made across the southern Indian Ocean to Cape Leeuwin in West Australia, where the *Bacchante* was compelled to remain some time on account of damage to her rudder. This gave the princes an opportunity of becoming familiar with the peculiar geographical conditions of West Australia, and seeing the actual conditions of colonial life. Then followed long visits to South Australia, Victoria, New South Wales, and Queensland. Some time was spent in the Fiji Islands, of which the princes saw a good deal. Thence a straight run was made for Japan, where the princes had a very busy time indeed in visiting the many sights of that interesting country. Touching at Shanghai, Canton, and the Straits Settlements, the *Bacchante* reached Ceylon, where the princes met Prof. Haeckel, and showed a good deal of interest in him and his work. Then up the Red Sea to Egypt, where and in Palestine three months were spent, months of pretty hard work for the princes. Touching at Greece, Crete, Ceylon, Sicily, and Gibraltar, the *Bacchante* passed out of the Mediterranean and reached home on August 5, 1882, after a cruise during its whole commission of 54,679 miles. There are numerous attractive illustrations in the book, one small map of the world, showing the route, and numerous sectional charts drawn by the princes themselves.

OUR BOOK SHELF

Dogs in Health and Disease, as Typified by the Greyhound. By J. S. Hurndall. Pp. vii. + 81. (London: E. Gould and Son, 1886.)

Dogs: their Management and Treatment in Disease. By G. Ashmont. Pp. v. + 212. (London: Sampson Low, 1885.)

THE first of these two manuals is intended to assist owners of dogs in diagnosing the complaint from which the animal is suffering, and to suggest remedies which may be applied until professional advice can be secured. The book advocates the "homœopathic" system of treatment, and the first twenty-five pages are devoted to a general exposition of this system "in simple unconventional language."

The second book is much fuller in detail, and is evidently suitable as a hand-book for the veterinarian; the mode of treatment differs very considerably from that recommended in Mr. Hurndall's manual, but we must leave to those practically acquainted with the subject the decision as to the relative merits of the two systems. The section relating to hydrophobia is naturally of interest at present; this disease is more fully treated than any other, though the author points out its extreme rarity; nevertheless it is admitted that the danger to persons bitten by a really mad dog is considerable—one-third to four-fifths of the cases, according to whether the wound has or has not been cauterised, are said to be fatal. On the other hand, Mr. Hurndall (p. 52) quotes eighty cases of persons bitten by mad animals, of which not a single one terminated fatally.

The section relating to parasites is somewhat meagre, though the author may be right in saying that the study of these animals more nearly concerns the zoologist than the veterinarian. These principles are perhaps carried a little too far when *Ascaris marginata* is spoken of as a "lumbricoid" which "resembles the common earthworm." The book is carefully written, and free from obvious misprints, but the large amount of matter compressed into a small volume has rendered necessary the use of rather inconveniently small type. F. E. B.